Sampling QA/QC Work Plan

Richardson Flat Tailings

Prepared by
Ecology & Environment, Inc.

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Approvals

Ecology & Environment, Inc.		EPA	
Scott Keen Project Manager	Date	Mike Zimmerman On-Scene Coordinator	Date

TABLE OF CONTENTS

LIST OF FIGURES

1.0 BACKGROUND

The [suspected] contamination is a result of:

Air migration of metals from tailings area. Groundwater to surface water migration of contaminants from both the tailings and the landfill areas. Potential direct leaching from tailings or landfill to surface water.

The following information is known about the site:

The site is located 3.5 miles northeast of Park City, Summit County, Utah. From 1975 to 1981 the 160 acre site was used for placement of mine tailings from mines owned by United Park City Mines (UPCM). Tailings were placed at depths of up to ten feet. In 1983 UPCM began to use soil to cover the tailings. This is an on-going project which was eighty-five percent complete by UPCM estimates during the time of a site visit in April 1992. A security fence has been put in place surrounding the site. Also on the site is a municipal/sanitary landfill. This land was leased by UPCM to the city of Park City and was used for landfill purposes in the mid-1970s. In 1990 a highway was placed through the middle of the landfill creating two sections (one section of the landfill on each side of the highway). Refuse in the path of the highway was removed and placed on top of the undisturbed landfill sections and covered with soil.

The site lies in a rural area with very widely scattered residences. It is within 1.5 miles of Prospector Square, a new residential community that supports Park City. Only three residences are within a one mile radius of the site.

The types of material(s) handled by this facility are:

Mine Tailings
Municipal/Sanitary Refuse

The volume(s) of contaminated materials to be addressed are:

2 million tons - mine tailings
Unknown quantity - municipal/sanitary refuse

The contaminants of concern are:

Metals from the mine tailings
Potential metals, volatile organics, BNA's, and pesticides from the landfill.

The basis of this information may be found in:

Previous studies.

2.0 DATA USE OBJECTIVES

The objective of this project/sampling event is to determine:

To determine immediate threats to human health and/or the environment.

For the purpose of:

Assuring site safety preceding remedial activities.

The data will be evaluated against:

Federal and State air, surface and groundwater standards and quality criteria and background concentrations with the intent of establishing whether an immediate threat to human health or the environment exists and of defining appropriate cleanup levels, if necessary.

3.0 Quality Assurance Objectives

As identified in Sections 1.0 and 2.0 the objective of this project/event applies to the following parameters:

Parameters	Matrix	Intended Use Of Data	QA Objective
BNA, VOC, Pesticides, Metals	Groundwater	Determine Threat	QA-2
Metals	Air	Determine Threat	QA-2
Inorganics, BNA, VOC, Pesticides	Surface Water	Determine Threat	QA-2
Inorganics	Soil	Determine Threat	QA-2
Inorganics	Sediment	Determine Threat	QA-2

Note: The QA-2 level of quality assurance will meet the Level IV analytical objectives for remedial response activities as defined in OSWER Directive 9355.0-7B. For each sample matrix the CLP lab will be asked to perform a matrix spike/matrix spike duplicate analysis.

4.0 Approach And Sampling Methodologies

4.1 Sampling Equipment

The following equipment will be utilized to obtain environmental samples from the respective media/matrix:

Parameter/Matrix	Sampling Equipment	Fabrication	Dedicated
BNA in Groundwater	Bailer	Teflon (PTFE)	Yes

Parameter/Matrix	Sampling Equipment	Fabrication	Dedicated
BNA in Surface Water	Sample Bottle	glass	Yes

Parameter/Matrix	Sampling Equipment	Fabrication	Dedicated
Metals in Air	Pump and Fiber Filter	paper/fiber	Yes

Parameter/Matrix	Sampling Equipment	Fabrication	Dedicated
Inorganics in Groundwater	Bailer	Teflon (PTFE)	Yes

Parameter/Matrix	Sampling Equipment	Fabrication	Dedicated
Inorganics in Sediment	Scoop	Teflon (PTFE)	Yes

Parameter/Matrix	Sampling Equipment	Fabrication	Dedicated
Inorganics in Soil	Scoop	Teflon (PTFE)	Yes

Parameter/Matrix	Sampling Equipment	Fabrication	Dedicated
Inorganics in Surface Water	Sample Bottle	plastic/polyethyene	Yes

Parameter/Matrix	Sampling Equipment	Fabrication	Dedi-cated
Pesticide in Groundwater	Bailer	Teflon (PTFE)	Yes

Parameter/Matrix	Sampling Equipment	Fabrication	Dedi-cated
Pesticide in Surface Water	Sample Bottle	glass	Yes

Parameter/Matrix	Sampling Equipment	Fabrication	Dedi-cated
VOC in Ground-water	Bailer	Teflon (PTFE)	Yes

Parameter/Matrix	Sampling Equipment	Fabrication	cated
VOC in Surface Water	Sample Vial	glass	Yes

4.2 Sampling Design

The sampling design is depicted on the attached Sample Location Map (Figure 2).

Proposed work can be divided into the following three broad tasks.

1. Air Sampling for the purpose of assessing the air migration of contaminants from the tailings area. This sampling and analysis will identify changes in the air migration of contaminants since the time of original sampling (July 1986). These changes may be significant due to the cover which has been applied to the tailings area during the past several years. Air sampling and analyses will be performed by the Emergency Response Team (ERT) of the USEPA.

2. Landfill Assessment. One upgradient and two downgradient monitoring wells will be installed and sampled to determine releases to groundwater from the municipal/sanitary landfill. Samples will be analyzed for base/neutral extractable compounds (BNAs), volatile organic compounds (VOCs), pesticides, and inorganics. In addition, the suitability of the location for landfill use will be evaluated.

3. Tailings Assessment. Work in the tailings (including the floodplain tailings area) will include several tasks. Soil cover will be measured in approximately 20 locations via soil borings. A grid pattern will be established to perform soil borings in a systematic fashion. Approximately ten soil samples from cover material will be collected and analyzed for inorganics. The tailings containment structure and its engineering design will be inspected and reviewed. One upgradient and five downgradient groundwater samples (from existing monitoring wells) will be collected for inorganic analysis to confirm previous findings of

releases to groundwater. Four surface water samples will be taken from the diversion ditch (two upgradient and two adjacent to the site) and analyzed for inorganics. Up to four sediment samples will be taken from the east side of Silver Creek in the wetlands area. And finally, six surface water samples will be collected from Silver Creek (two upgradient, two adjacent to the site, and two downstream from the site). These last six samples will be analyzed for inorganics and organics (BNAs, VOCs, pesticides).

Following is a summary of the proposed sampling and analytical activities:

Number of Samples	Type of Sample	Analysis
10	Cover Soil	Inorganics
20	Soil Borings	Depth of Tailings Cover
5	Air	Metals
6	Groundwater (tailings area)	Inorganics
4	Sediment	Inorganics
3	Groundwater (landfill area)	Inorganics, BNA, VOCs, Pesticides
4	Surface Water (diversion ditch)	Inorganics
6	Surface Water (Silver Creek)	Inorganics, BNAs, VOCs, Pesticides
5	Opportunity Samples (SW, GW, soil or sediment)	Inorganics, BNAs, VOCs, Pesticides
1	Trip Blank	VOCs
1	Duplicate (SW or GW)	Inorganics, BNAs, VOCs, Pesticides

Note: One surface or groundwater sample will be collected in triple volume for lab QC purposes.

4.3 Standard Operating Procedures

4.3.1 Sample Documentation

All sample documents must be completed legibly, in ink. Any corrections or revisions must be made by lining through the incorrect entry and by initiating the error.

FIELD LOG BOOK

The Field Log Book is essentially a descriptive notebook detailing site activities and observations so that an accurate account of field procedures can be reconstructed in the writer's absence. All entries should be dated and signed by the individuals making the entries, and should include (at a minimum) the following:

1. Site name and project number.
2. Name(s) of personnel on-site.
3. Dates and times of all entries (military time preferred).
4. Descriptions of all site activities, including site entry and exit times.
5. Noteworthy events and discussions.
6. Weather conditions.
7. Site observations.
8. Identification and description of samples and locations.
9. Subcontractor information and names of on-site personnel.
10. Date and time of sample collections, along with chain-of-custody information.
11. Record of photographs.
12. Site sketches.

SAMPLE LABELS

Sample labels must clearly identify the particular sample, and should include the following:

1. Site name and number.
2. Time sample was taken.
3. Sample preservation.
4. Initial of sampler(s).

Optional, but pertinent, information:

1. Analysis requested.
2. Sample location.

Sample labels must be securely affixed to the sample container. Tie-on labels can be used is properly secured.

CHAIN-OF-CUSTODY RECORD

A Chain-of-Custody record must be maintained from the time the sample is taken to its final deposition. Every transfer of custody must be noted and signed for, and a copy of this record kept by each individual who has signed. When samples (or groups of samples) are not under direct control of the individual responsible for them, they must be stored in a locked container sealed with a Chain-of-Custody seal.

The Chain-of-Custody record should include (at minimum) the following:

1. Sample identification number.
2. Sample information.
3. Sample location.
4. Sample date.
5. Name(s) and signature(s) of sampler(s).
6. Signature(s) of any individual(s) with control over samples.

CHAIN-OF-CUSTODY SEALS

Chain-of-Custody Seals demonstrate that a sample container has not been tampered with, or opened.

The individual in possession of the sample(s) must sign and date the seal, affixing it in such a manner that the container cannot be opened without breaking the seal. The name of this individual, along with a description of the sample packaging, must be noted in the Field Logbook.

4.3.2 Sampling SOPs

Sampling SOPs from the USEPA Emergency Response Branch Region VIII Quality Assurance Project Plan will be followed. Sample "splits" for all samples except air samples will be available to UPCM and to the State of Utah upon request. It is difficult to offer sample splits of air samples because the amount of particulate to be collected cannot be predetermined and the lab will need a minimum quantity for analyses.

AIR SAMPLING AND MONITORING

Both total particulate loading and qualitative analysis of the particulates can be calculated using medium volume sampling technique.

Ambient air is drawn into a covered housing and through a filter by means of a blower at flow rates between 2 and 20 liters/minute. Particles within the size range of 100 to 0.1-mm diameter are collected on the filter, although sampler flow rate and geometry tends to favor particles less than 60-mm aerodynamic diameter. The mass concentration of suspended particulate is computed by measuring the mass of collected particulates (gravimetric analysis) and the volume of air sampled.

After sample collection, pre-tarred filters are analyzed gravimetrically to determine the total particulate loading. Trace metal analyses may be accomplished by extracting all or part of the filter and analyzing the extract accordingly (i.e., atomic absorption, [ICP]). When trace metal analysis is performed, it is important to submit blank filters from each lot to the laboratory to determine background concentrations.

GROUNDWATER WELL SAMPLING

Prior to sampling a well, the well will be purged. For this project, this will be accomplished with a bailer. Purge water will be placed back in the well or will be poured on the ground near the well from which it came, following sampling.

Brush off well cap prior to opening, unlock and open well cap. A photoionization detector (HNU) or flame ionization detector (OVA) will be used on the escaping gases to determine the need for respiratory protection. Using a decontaminated water level indicator, the water level will be measured. Total depth of the well will be obtained with a depth sounder and the volume of water in the well will be calculated.

Three well volumes at a minimum should be purged if possible. Equipment must be decontaminated prior to use and between wells if dedicated equipment is not used.

Once purging is completed and the correct laboratory-cleaned sample jars and/or vials have been prepared, sampling will proceed. The sampling device (which may or may not be the same as the purging device) has been selected so as to not affect the integrity of the sample. Sampling will occur in a progression from the least to most contaminated well, if known.

The water sample will be collected using a teflon or stainless steel bailer. The bailer will be attached to a clean, dedicated, nylon rope and introduced into the well. The bailer will be lowered to the approximate mid-point of the screened interval. Once the sample is collected, care will be taken not to unduly agitate or aerate the water while pouring into the appropriate sample containers.

Measure the conductivity, temperature, and pH of the groundwater in a separate container. Record all field measurements on the field data sheets and in the field notebook.

SEDIMENT SAMPLING

Sediment is collected from beneath an aqueous layer either directly, using a hand held device such as a shovel, trowel, or auger, or indirectly using a remotely actuated device such as a Ekman or Ponar dredge.

Selection of a sediment sampling device is most often contingent upon: (1) Depth of water at the sampling location; and (2) the physical characteristics of the medium to be sampled.

Collection of surface sediment from beneath a shallow aqueous layer can be accomplished with a stainless steel or plastic scoop. This method can be used to collect consolidated sediments but is somewhat limited by the depth of the aqueous layer.

SURFACE WATER SAMPLING

This procedure is applicable for the collection of representative liquid samples from streams, rivers, ponds, lagoons and surface impoundments. Due to the widely diverse situations which arise when collecting surface water samples, no universal sampling procedure can be recommended for all sampling situations.

Sampling of both aqueous and non-aqueous liquids is generally accomplished through use of one of the following techniques:

- -Kemmerer Bottle
- -Bacon Bomb
- -Dip Sampler
- -Direct Collection Method

In order to collect a representative sample, the hydrology and morphometrics of a stream or impoundment should be determined prior to sampling. Generally, the deciding factors in the selection of a sampling device are: (1) Whether the sample will be collected from shore or from a boat on the impoundment; (2) the desired sample depth; and (3) the depth and flow of a river or stream.

Samplers should be of the proper material (glass, stainless steel, etc.) for the analysis requested.

The DIRECT METHOD of sample collection may be used for shallow water bodies where access to the sampling location does not pose a safety concern.

SOIL SAMPLING

Collection of samples from near-surface soil will be accomplished with scoops. Surface debris will be removed to the required depth with this equipment, then a plastic scoop can be used to collect the sample. This method can be used in most soil types but is limited to sampling near surface areas. Sampling at depth will be accomplished with augers.

4.3.3 Sample Handling and Shipment

Each of the sample bottles will be sealed and labeled according to the following protocol. Caps will be secured with custody seals. Bottle labels will contain all required information including sample number, time and date of collection, analysis requested, and preservative used. Sealed bottles will be placed in large metal or plastic coolers, and padded with an absorbent material such as vermiculite.

All sample documents will be affixed to the underside of each cooler lid. The lid will be sealed and affixed on at least two sides with EPA custody seals so that any sign of tampering is easily visible.

4.3.4 Decontamination Procedures

Decontamination procedures will also follow those described in the USEPA Region VIII Emergence Response Branch Quality Assurance Project Plan. These procedures can be summarized as follows.

<u>Monitoring Well Installation</u>. Prior to mobilization on-site heavy equipment will be cleaned thoroughly to remove all oil, grease, mud, tar, oil-based preservatives, etc. The cleaning process will consist of high pressure/detergent/hot water washing of the drilling equipment and a high pressure/hot water final rinse. The same procedure will be followed after each well is drilled. Special attention will be given to all down-hole tools. All drilling and associated equipment will be thoroughly decontaminated prior to departure from the site to ensure that potential contaminants are not transported from the site.

<u>Soil Borings</u>. If soil borings are performed only for determination of the depth of soil cover, no decontamination of augering equipment will be performed between borings. If soil or tailings samples are collected concurrently with determination of soil cover thickness, augering equipment will be cleaned with detergent solution followed by deionized water rinse between each boring location. All sample handling equipment will be dedicated, thus requiring no decontamination. If stainless steel

bowls are used for homogenizing samples, bowls will be washed with detergent solution and rinsed with deionized water between boring locations.

Groundwater Sampling. Bailers will be dedicated Teflon equipment. New braided nylon cord will be used at each monitoring well for bailing. Samples will be taken directly from bailers, thus decontamination steps will not be required.

Surface Water Sampling. Samples will be collected directly into sample containers.

Sediment Sampling. Dedicated Teflon scoops will be used for sample collection.

4.4 Schedule of Activities

Table 1: Proposed Schedule of Work

Activity	Start Date	End Date
Air Sampling by ERT	06/08/92	06/11/92
Monitoring Well Installation	06/08/92	06/11/92
Soil Borings, Surface Water, Soil, Sediment and Groundwater Sampling	07/13/92	07/31/92
Delivery of Data and Reports	09/15/92	09/30/92

5.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

The EPA On-Scene Coordinator, Mike Zimmerman, will provide overall direction to Ecology & Environment, Inc. staff concerning project sampling needs, objectives and schedule.

The Ecology & Environment, Inc. Project Manager, Scott Keen, is the primary point of contact with the EPA On-Scene Coordinator. The Project Manager is responsible for the development and completion of the Sampling QA/QC Plan, project team organization, and supervision of all project tasks, including reporting and deliverables. The Project Manager is also responsible for ensuring field adherence to the Sampling QA/QC Plan and recording any deviations. The Site QC Coordinator is also the primary project team contact with the lab.

The following sampling personnel will work on this project:

Personnel	Responsibility
Scott Keen	Project Manager
Don Cameron	H & S Officer, Sampler
Jeff Fleming	Sampler
Mike Sullivan	Review/Inspection of Tailings Containment
Troy Sanders	Monitoring Well Installation

The following laboratories will be providing the following analyses:

Lab Name / Location	Lab Type	Parameters
Unknown	CLP	Metals, BNAs, VOCs, Pesticides
USEPA	ERT	Metals (air samples)

6.0 QUALITY ASSURANCE REQUIREMENTS

The following requirements apply to the respective QA Objectives and parameters identified in Section 3.0:

The following QA Protocols for QA-2 data are applicable to all sample matrices and include:

1. Provide sample documentation in the form of field logbooks, the appropriate field data sheets and chain of custody forms. Chain of custody sheets are optional for field screening locations.

2. All instrument calibration and/or performance check procedures/methods will be summarized and documented in the field/personal or instrument log notebook.

3. The detection limit will be determined and recorded, along with the data, where appropriate.

4. Document sample holding times; this includes documentation of sample collection and analysis dates.

5. Provide initial and continuing instrument calibration data.

6a. For soil, sediment and water samples, include rinsate blanks and trip blanks.

6b. For air samples, include lot blanks, field blanks, co-located samples, blind spikes, breakthrough, and surrogate/matrix spikes.

7. Performance Evaluation samples are optional, if available.

8. Choose any one or any combination of the following three options:

   1. Definitive identification (choose one):

      a. Screened data - confirm the identification of analytes via an EPA-approved method different from the screening method (field or lab) on at least 10% of the preliminary screened samples collected; provide documentation such as gas chromatograms, mass spectra, etc.
      b. Unscreened data - confirm the identification of analytes via an EPA-approved method on all unscreened environmental samples; provide documentation such as gas chromatograms, mass spectra, etc.

   2. Non-definitive quantitation (choose one):

      a. Screened data - provide documentation of quantitative results from both the screening method and the EPA verification method.

      b. Unscreened data - provide documentation of quantitative results.

   3. Definitive quantitation/analytical error (choose one):

      a. Screened data - determine the analytical error by calculating the precision, accuracy, and coefficient of variation by preparing and analyzing eight (8) QA replicates from the subset of samples used to verify screening results using an EPA-approved method.

      b. Unscreened data - determine the analytical effort by calculating the precision, accuracy, and coefficient of variation by preparing and analyzing eight (8) samples analyzed using an EPA-approved method.

7.0 DELIVERABLES

The Ecology & Environment, Inc. Task Leader, Scott Keen, will maintain contact with the EPA On-Scene Coordinator, Mike Zimmerman, to keep him informed about the technical and financial progress of this project. This communication will commence with the issuance of the work assignment and project scoping meeting. Activities under this project will be reported in status and trip reports and other deliverables (e.g., analytical reports, final reports) described herein. Activities will also be summarized in appropriate format for inclusion in monthly and annual reports.

The following deliverables will be provided under this project:

Figures

The following illustrations will be provided:

Figures
Drawings
Well borehole logs

Analytical Report

An analytical report will be prepared for samples analyzed under this plan. Information regarding the analytical methods/procedures employed, sample results, QA/QC results, chain-of-custody documentation, laboratory correspondence, and raw data will be provided within this deliverable.

Final Report

A final report will be prepared to correlate available background information with data generated under this sampling event and identify supportable conclusions and recommendations which satisfy the objectives of this sampling QA/QC plan.

8.0 DATA VALIDATION

QA 2

Data generated under this QA/QC Sampling Plan will be evaluated accordingly with appropriate criteria contained in the Removal Program Data Validation Procedures which accompany OSWER Directive #9360.4-1.

Specific data review activities for QA 2 should be performed by the following approach:

1. Of the samples collected in the field, 10% will be confirmed for identification, precision, accuracy, and error determination.
2. The results of 10% of the samples in the analytical data packages should be evaluated for holding times,

blank contamination, spike (surrogate/matrix) recovery, and detection capability.

3. The holding times, blank contamination, and detection capability will be reviewed for the remaining samples.

Richardson Flat Tailings
Figure 1 Site Location Map

Richardson Flat Tailings
Figure 2 Sample Location Map

FIGURE 3

TARGET COMPOUND LIST (TCL) AND

CONTRACT REQUIRED QUANTITATION LIMITS (CROL)*

Volatiles		CAS Number	Quantitation Limits** Water ug/L	Low Soil/Sediment a ug/Kg
1.	Chloromethane	74-87-3	10	10
2.	Bromomethane	74-83-9	10	10
3.	Vinyl Chloride	75-01-4	10	10
4.	Chloroethane	75-00-3	10	10
5.	Methylene Chloride	75-09-2	5	5
6.	Acetone	67-64-1	10	10
7.	Carbon Disulfide	75-15-0	5	5
8.	1,1-Dichloroethane	75-35-4	5	5
9.	1,1-Dichloroethane	75-34-3	5	5
10.	1,2-Dichloroethane (total)	540-59-0	5	5
11.	Chloroform	67-66-3	5	5
12.	1,2-Dichloroethane	107-06-2	5	5
13.	2-Butanone	78-93-3	10	10
14.	1,1,1-Trichloroethane	71-55-6	5	5
15.	Carbon Tetrachloride	56-23-5	5	5
16.	Vinyl Acetate	108-05-4	10	10
17.	Bromodichloromethane	75-27-4	5	5
18.	1,2-Dichloropropene	78-87-5	5	5
19.	cis-1,3-Dichloropropene	10061-01-5	5	5
20.	Trichloroethene	79-01-6	5	5
21.	Dibromochloromethane	124-48-1	5	5
22.	1,1,2-Trichloroethane	79-00-5	5	5
23.	Benzene	71-43-2	5	5
24.	trans-1,3-Dichloropropene	10061-02-6	5	5
25.	Bromoform	75-25-2	5	5
26.	4-Methyl-2-pentanone	108-10-1	10	10
27.	2-Hexanone	591-78-6	10	10
28.	Tetrachloroethane	127-18-4	5	5
29.	Toluene	108-88-3	5	5
30.	1,1,2,2-Tetrachloroethane	79-34-5	5	5
31.	Chlorobenzene	108-90-7	5	5
32.	Ethyl Benzene	100-41-4	5	5
33.	Styrene	100-42-5	5	5
34.	Xylenes (total)	1330-20-7	5	5

a Medium Soil/Sediment Contract Required Quantitation Limits (CRQL) for Volatile TCL Compounds are 125 times the individual Low Soil/Sediment CRQL.

* Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

** Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on dry weight basis as required by the contract, will be higher.

Semivolatiles		CAS Number	Quantitation Limits** Water ug/L	Low Soil/Sediment ug/Kg
35.	Phenol	108-95-2	10	330
36.	bis (2-Chloroethyl) ether	111-44-4	10	330
37.	2-Chlorophenol	95-57-8	10	330
38.	1,3-Dichlorobenzene	541-73-1	10	330
39.	1,4-Dichlorobenzene	106-46-7	10	330
40.	Benzyl alcohol	100-51-6	10	330
41.	1,2-Dichlorobenzene	95-50-1	10	330
42.	2-Methylphenol	95-48-7	10	330
43.	bis (2-Chloroisopropyl) ether	108-60-1	10	330
44.	4-Methylphenol	106-44-5	10	330
45.	N-Nitroso-di-n-dipropylamine	621-64-7	10	330
46.	Hexachloroethane	67-72-1	10	330
47.	Nitrobenzene	98-95-3	10	330
48.	Isophorone	78-59-1	10	330
49.	2-Nitrophenol	88-75-5	10	330
50.	2,4-Dimethylphenol	105-67-9	10	330
51.	Benzoic acid	65-85-0	50	1600
52.	bis (2-Chloroethoxy) methane	111-91-1	10	330
53.	2,4-Dichlorophenol	120-83-2	10	330
54.	1,2,4-Trichlorobenzene	120-82-1	10	330
55.	Naphthalene	91-20-3	10	330
56.	4-Chloroaniline	106-47-8	10	330
57.	Hexachlorobutadiene	87-68-3	10	330
58.	4-Chloro-3-methylphenol (para-chloro-meta-cresol)	59-50-7	10	330
59.	2-Methylnaphthalene	91-57-6	10	330
60.	Hexachlorocyclopentadiene	77-47-4	10	330
61.	2,4,6-Trichlorophenol	88-06-2	10	330
62.	2,4,5-Trichlorophenol	95-95-4	50	1600
63.	2-Chloronaphthalene	91-58-7	10	330
64.	2-Nitroaniline	88-74-4	50	1600
65.	Dimethylphthalate	131-11-3	10	330
66.	Acenaphthylene	208-96-8	10	330
67.	2,6-Dinitrotoluene	606-20-2	10	330
68.	3-Nitroaniline	99-09-2	50	1600
69.	Acenaphthene	83-32-9	10	330

70.	2,4-Dinitrophenol	51-28-5	50	1600
71.	4-Nitrophenol	100-02-7	50	1600
72.	Dibenzofuran	132-64-9	10	330
73.	2,4-Dinitroroluene	121-14-2	10	330
74.	Diethylphthalate	84-66-2	10	330
75.	4-Chlorophenyl-phenyl ether	7005-72-3	10	330
76.	Fluorene	86-73-7	10	330
77.	4-Nitroaniline	100-01-6	50	1600
78.	4,6-Dinitro-2-methylphenol	534-52-1	50	1600
79.	N-nitrosodiphenylamine	86-30-6	10	330
80.	4-Bromophenyl-phenyl ether	101-55-3	10	330
81.	Hexachlorobenzene	118-74-1	10	330
82.	Pentachlorophenol	87-86-5	50	1600
83.	Phenanthrene	85-01-8	10	330
84.	Anthracene	120-12-7	10	330
85.	Di-n-butylphthalate	84-74-2	10	330
86.	Fluoranthene	206-44-0	10	330
87.	Pyrene	129-00-0	10	330
88.	Butylbenzylphthalate	85-68-7	10	330
89.	3,3-Dichlorobenzidine	91-94-1	20	660
90.	Benzo (a) anthracene	56-55-3	10	330
91.	Chrysene	218-01-9	10	330
92.	bis (2-Ethylhexyl) phthalate	117-81-7	10	330
93.	Di-n-octylphthalate	117-84-0	10	330
94.	Benzo (b) fluoranthene	205-99-2	10	330
95.	Benzo (k) fluoranthene	207-08-9	10	330
96.	Benzo (a) pyrene	50-32-8	10	330
97.	Indeno (1,2,3-cd) pyrene	193-39-5	10	330
98.	Dibenz (a,h) anthracene	53-70-3	10	330
99.	Benzo (g,h,i) perylene	191-24-2	10	330

b Medium Soil/Sediment Contract Required Quantitation Limits (CRQL) for Semivolatile TCL Compounds are 60 times the individual Low Soil/Sediment CRQL.

* Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

** Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on dry weight basis as required by the contract, will be higher.

	Pesticides/PCBs	CAS Number	Quantitation Limits** Water ug/L	Low Soil/Sediment ug/Kg
100.	alpha-BHC	319-84-6	0.05	8.0
101.	beta-BHC	319-85-7	0.05	8.0
102.	delta-BHC	319-86-8	0.05	8.0
103.	gamma-BHC (Lindane)	58-89-9	0.05	8.0
104.	Heptaclor	76-44-8	0.05	8.0
105.	Aldrin	309-00-2	0.05	8.0
106.	Heptachlor epoxide	1024-57-3	0.05	8.0
107.	Endosulfan I	959-98-8	0.05	8.0
108.	Dieldrin	60-57-1	0.10	16.0
109.	4,4'-DDE	72-55-9	0.10	16.0
110.	Endrin	72-20-8	0.10	16.0
111.	Endosulfan II	33213-65-9	0.10	16.0
112.	4,4'-DDD	72-54-8	0.10	16.0
113.	Endosulfan sulfate	1031-07-8	0.10	16.0
114.	4,4'-DDT	50-29-3	0.10	16.0
115.	Methoxychlor	72-43-5	0.5	80.0
116.	Endrin ketone	53494-70-5	0.10	16.0
117.	alpha-Chlordane	5103-71-9	0.5	80.0
118.	gamma-Chlordane	5103-74-2	0.5	80.0
119.	Toxaphene	8001-35-2	1.0	160.0
120.	Aroclor-1016	12674-11-2	0.5	80.0
121.	Aroclor-1221	11104-28-2	0.5	80.0
122.	Aroclor-1232	11141-16-5	0.5	80.0
123.	Aroclor-1242	53469-29-6	0.5	80.0
124.	Aroclor-1248	12672-29-6	0.5	80.0
125.	Aroclor-1254	11097-69-1	1.0	160.0
126.	Aroclor-1260	11096-82-5	1.0	160.0

c Medium Soil/Sediment Contract Required Quantitation Limits (CRQL) for Pesticides/PCB TCL compounds are 15 times the individual Low Soil/Sediment CRQL.

* Specific quantitation limits are highly matrix dependent. The

quantitation limits listed herein are provided for guidance and may not always be achievable.

** Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on dry weight basis as required by the contract, will be higher.

INORGANIC TARGET ANALYTE LIST (TAL)

Analyte	Contract Required Detection Limit 1,2 (ug/L -- water*)
Aluminum	200
Antimony	60
Arsenic	10
Barium	200
Beryllium	5
Cadmium	5
Calcium	5000
Chromium	10
Cobalt	50
Copper	25
Iron	100
Lead	5
Magnesium	5000
Manganese	15
Mercury	0.2
Nickel	40
Potassium	5000
Selenium	5
Silver	10
Sodium	5000
Thallium	10
Vanadium	50
Zinc	20
Cyanide	10

1 Subject to the restrictions specified in the first page of Part G. Section IV of Exhibit D (Alternate Methods - Catastrophic Failure) any analytical method specified in SOW Exhibit D may be utilized as long as the documented instrument or method detection limits meet the Contract Required Detection Limit (CRDL) requirements. Higher detection limits may only be used in the following circumstances:

If the sample concentration exceeds five times the detection limit of the instrument or method in use, the value may be reported even though the instrument or method detection limit may not equal the CRDL. This is illustrated in the example below:

For lead:
Method in use = ICP
Instrument Detection Limit (IDL) = 40
Sample concentration = 220
Contract Required Detection Limit = 5

* Sediment detection limit 100x water

SAMPLE BOTTLE REQUIREMENTS

ORGANICS			
Analysis	Soil/Solids	Water	Preservation
Volatiles (VOA)	2x40ml glass	2x40ml glass	Ice
Semi-volatiles (BNA)	1x8oz glass	1x80oz amber glass	Ice
Pesticides/PCBs	1x8oz glass	1x80oz amber glass	Ice
Organophosphate Pest.	1x8oz glass	1x80oz amber glass	Ice
Chlorinated Herbicides	1x8oz glass	1x80oz amber glass	Ice
Dioxin	1x8oz glass		None
High Concentration	1x8oz glass	2x40ml glass	None

Note: For QA Level 2, a matrix spike and matrix spike duplicate should be collected, therefore a triple volume of one sample per matrix. Also one water VOA sample should be carried as a trip blank.

INORGANICS			
Analysis	Soil/Solids	Water	Preservation
Metals	1x8oz glass	1x1L poly (Nitric Acid pH<2)	Ice
Cyanide	1x8oz glass	1x1L poly (NaOH pH>12)	Ice

RADIOCHEMISTRY			
Analysis	Soil/Solids	Water	Preservation
Radioisotopes	1x8oz glass	1x1 Gallon glass/poly	None
Total Uranium	1x8oz glass	1x1 Gallon glass/poly	None
Gross Alpha/Beta		1x1 Gallon glass/poly	None

TCLP			
Analysis	Soil/Solids	Water	Preservation
Full TCLP	4x8oz glass	1x1L poly+2x80oz glass	Ice
Metals	1x8oz glass	1x1L poly	None
Volatile (VOA)	2x40ml glass	4x40ml glass	Ice
Semi-volatile (BNA)	1x8oz glass	1x80oz amber glass	Ice
Pesticides/Herbicides	1x8oz glass	1x80oz amber glass	Ice

Analysis	TCLP Sludge(<.5% solids)	Solvent/Oil	Preservation
Full TCLP	2x80oz glass+1L poly	3x80oz glass	Ice
Metals	1x1L poly	2x80oz amber glass	None
Volatile (VOA)	4x40ml glass	0.5L amber glass	Ice
Semi-volatile (BNA)	1x80oz amber glass	1x80oz amber glass	Ice
Pesticides/Herbicides	1x80oz amber glass	1x80oz amber glass	Ice

Note: DO NOT ADD ANY ACID PRESERVATIVES TO ANY TCLP SAMPLE!!!
DO NOT TAKE LIQUID SAMPLES IN 4oz OR 8oz GLASS JARS, THEY LEAK!!!

APPROXIMATE SAMPLE WEIGHTS FOR SHIPPING

1x40ml water is 0.04 KG
1x40ml soil is 0.1 KG
1x8oz soil is 0.6 KG

1x80oz water is 2.4 KG
1x1L water is 1.0 KG
1x0.5L water is 0.5 KG